Constructing an Origin/ Destination matrix of Brazilian interurban transport with mobile phone big data

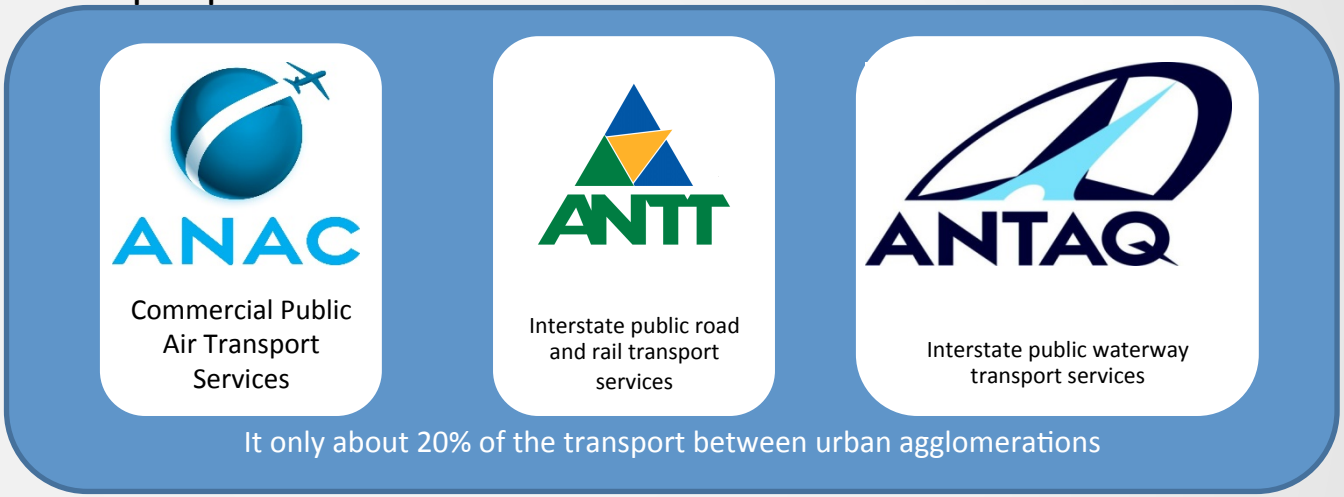
Fabiana Todesco - Director of the Department of Airports Planning and Management

Leandro Rodrigues e Silva - Civil Aviation Planning and Studies Coordinator

Civil Aviation Secretary / Ministry of Infrastructure

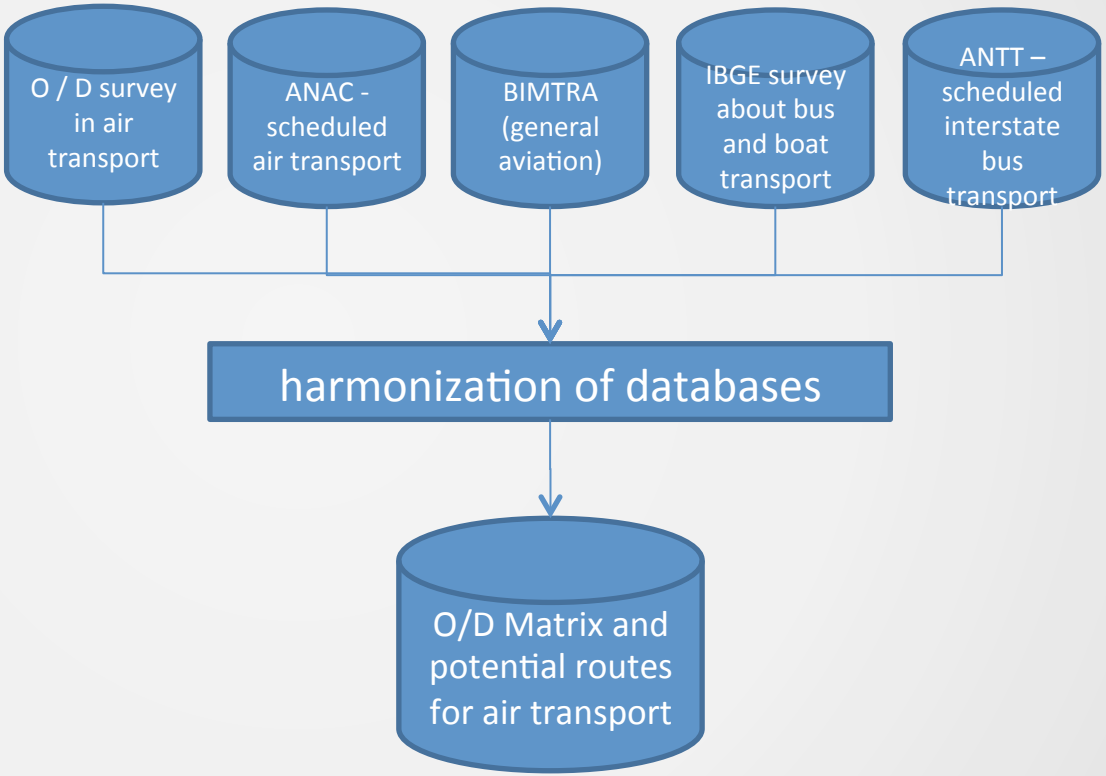
Problem

- [x] What do we know about long distance transportation of people in Brazil?



- Needs:
  - General Aviation;
  - Intercity road and waterway transport services (into the states);
  - Long distance travel by car (private).

Constructing the first O / D matrix



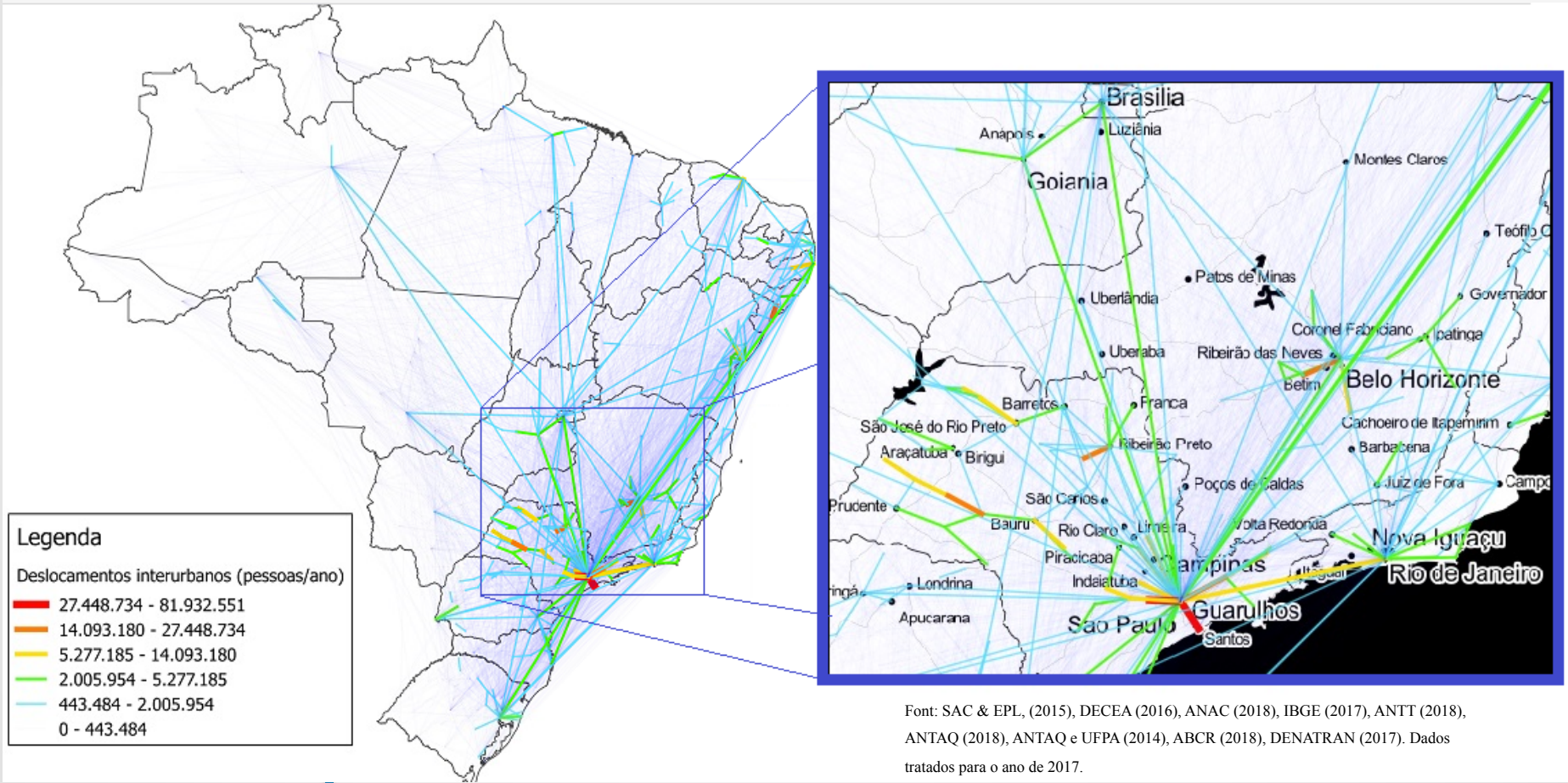
Constructing the first O / D matrix

Modal split

Mode of transport		Interurban demand (millions of people / year)	Subtotal (millions of people / year)	% off mass mode of transport	Overall %
mass	Air transport (comercial and GA)	100,31	390,92	26%	11%
	Coach transport	285,88		73%	31%
	Rail transport	1,31		0%	0%
	Water transport	3,42		1%	0%
private	Deslocamento por automóvel particular	543,96	543,96	-	58%
Total		934,88	934,88	100%	100%

Font: SAC & EPL, (2015), DECEA (2016), ANAC (2018), IBGE (2017), ANTT (2018), ANTAQ (2018), ANTAQ e UFPA (2014), ABCR (2018), DENATRAN (2017). Dados tratados para o ano de 2017.

Routes betwen urban agglomerations



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Some of the matrix uses in "PAN – Plano Aeroviário Nacional" (Brazilian Civil Aviation Master Plan)

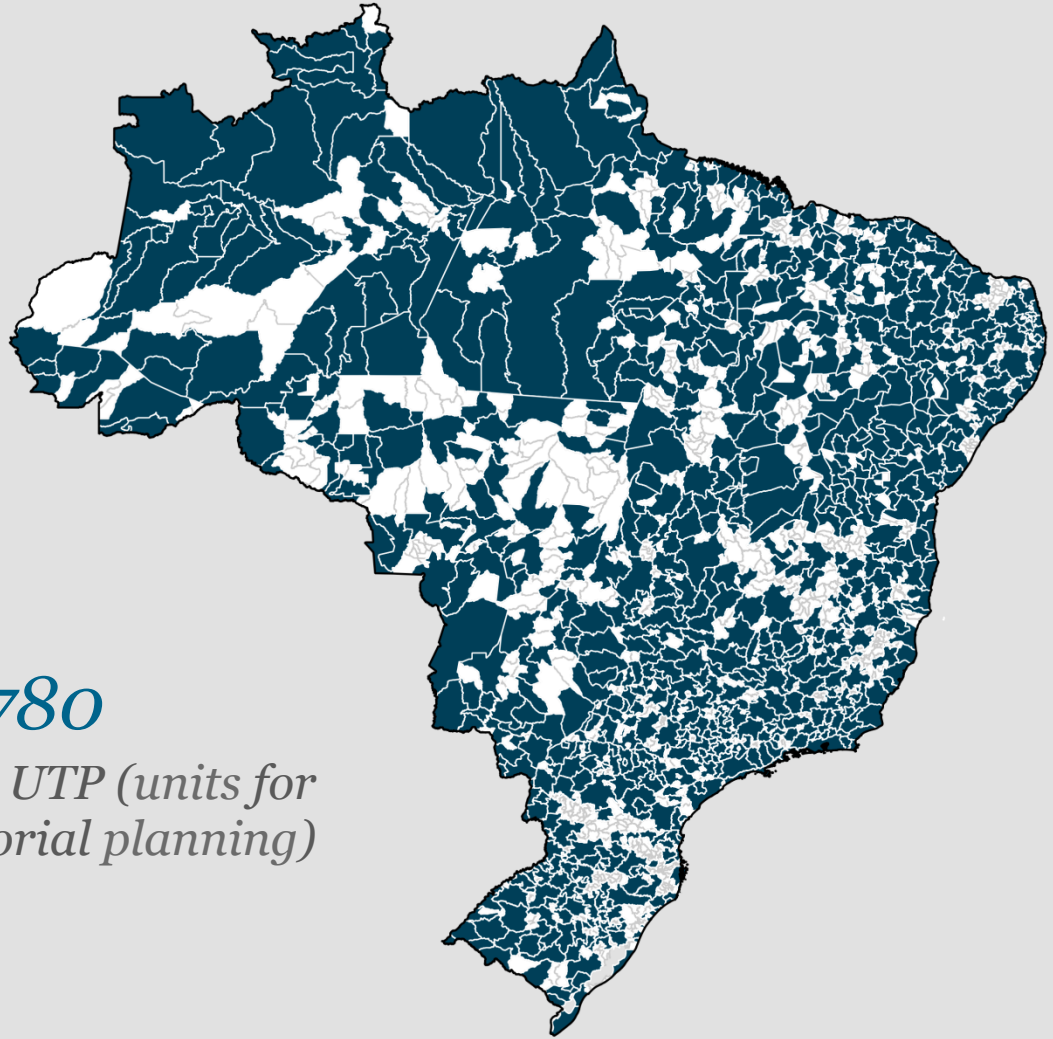
- Identification of potential new routes for airlines
- Estimated additional revenue for airlines
- Identification of destinations for new simulated airports
- Identification of repressed demand for air transport

Constructing the new O / D matrix

Escope:

- Big data of mobile phones
- Air and non-air transport division
- Statistical treatment and expansions
- Construction of O / D matrix between urban agglomerations (780 UTPs)

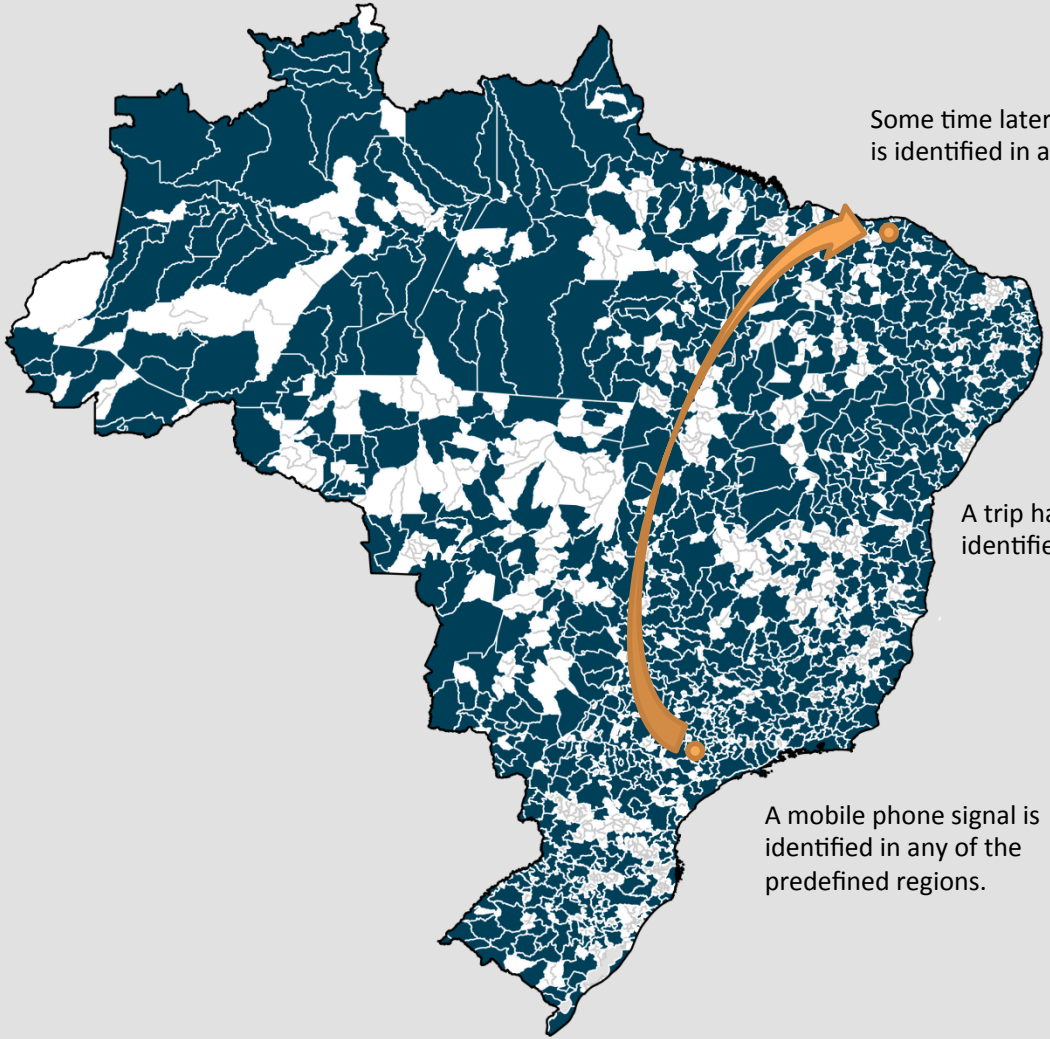
UTPs



780

UTP (units for territorial planning)

How to identify travel with mobile phone data?



How to identify travel with mobile phone data?

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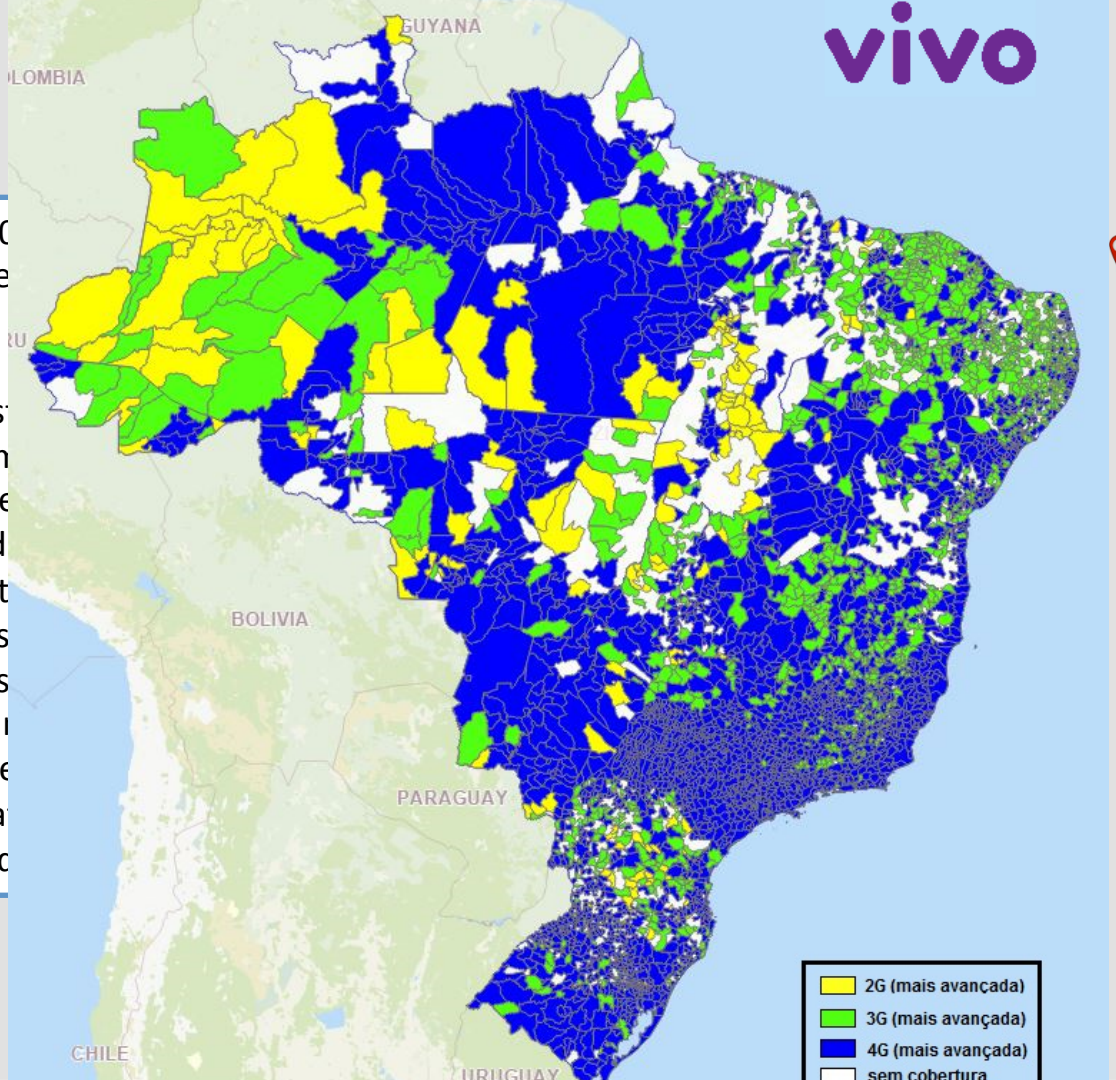
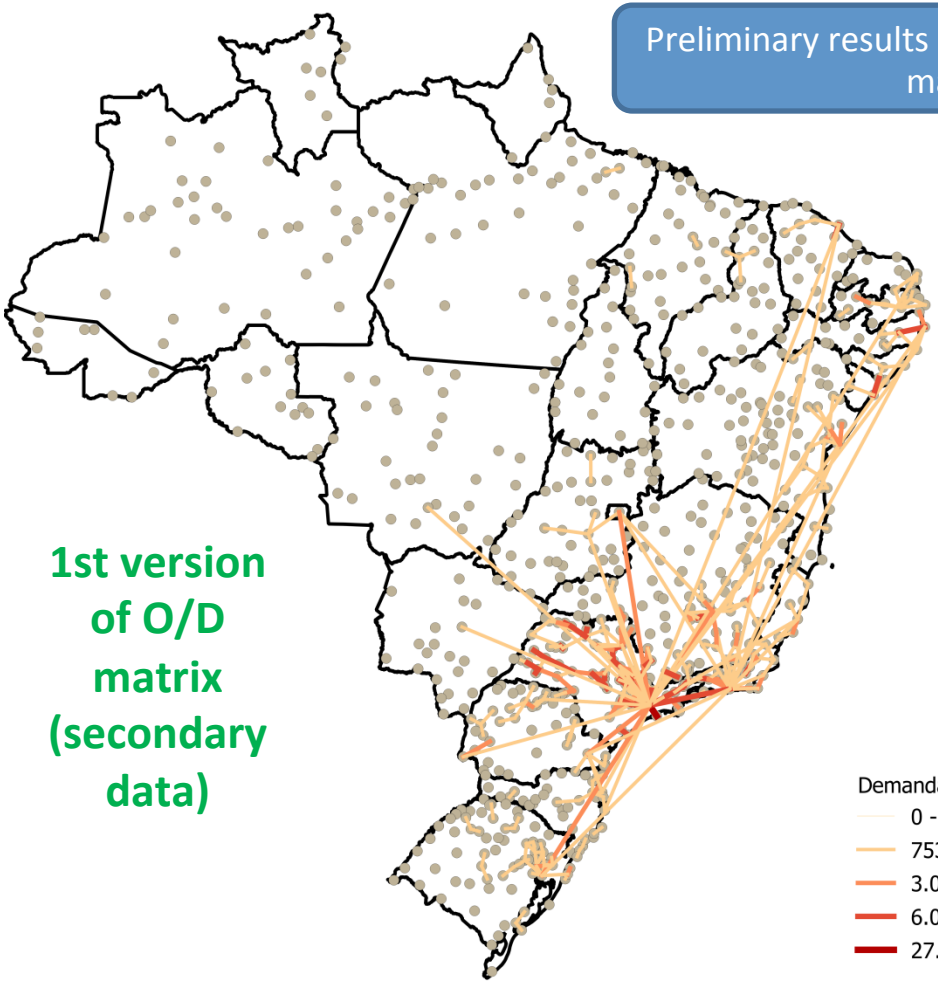


Comparison between the estimation types of an O / D matrix

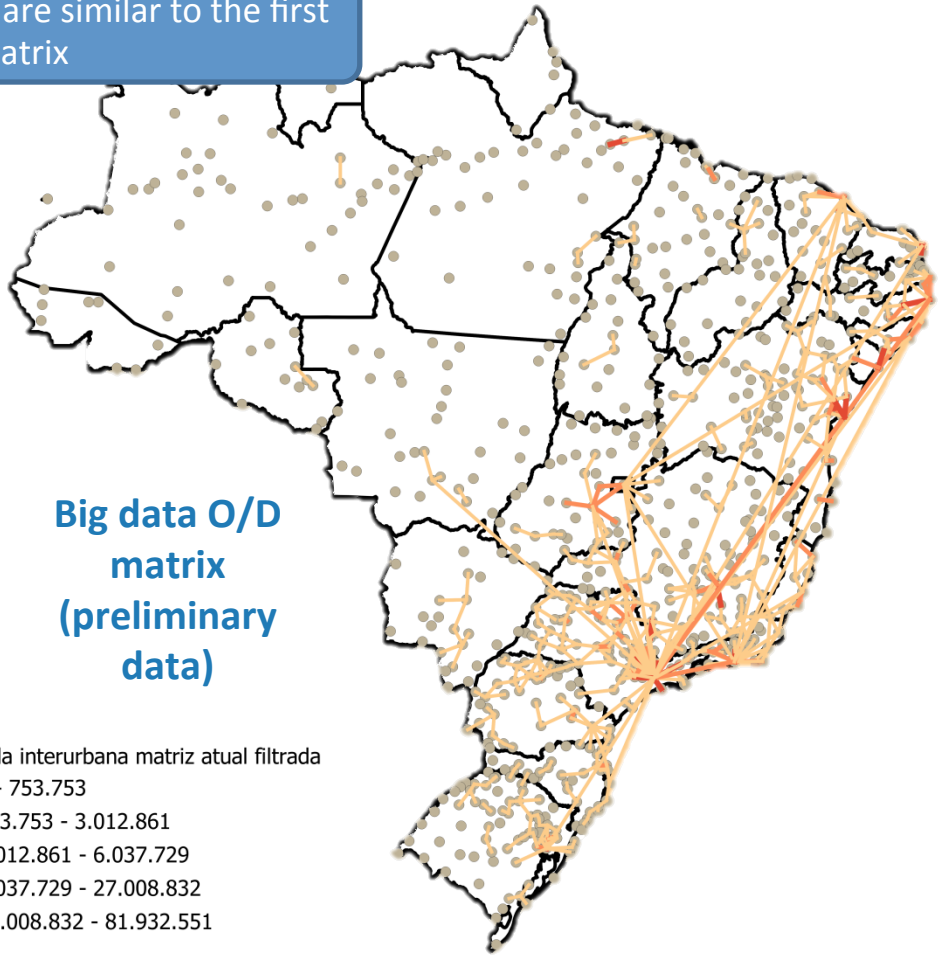
	Traditional survey (in-person)	Secondary data join	Mobile Big Data
Confiability	medium	low	high
Sampling range	small, and incomplet	incomplet	big
Cost	high	low	medium
Time	slow	fast	fast

Preliminary results are similar to the first matrix

1st version of O/D matrix (secondary data)



Big data O/D matrix (preliminary data)



Demanda interurbana matriz atual filtrada

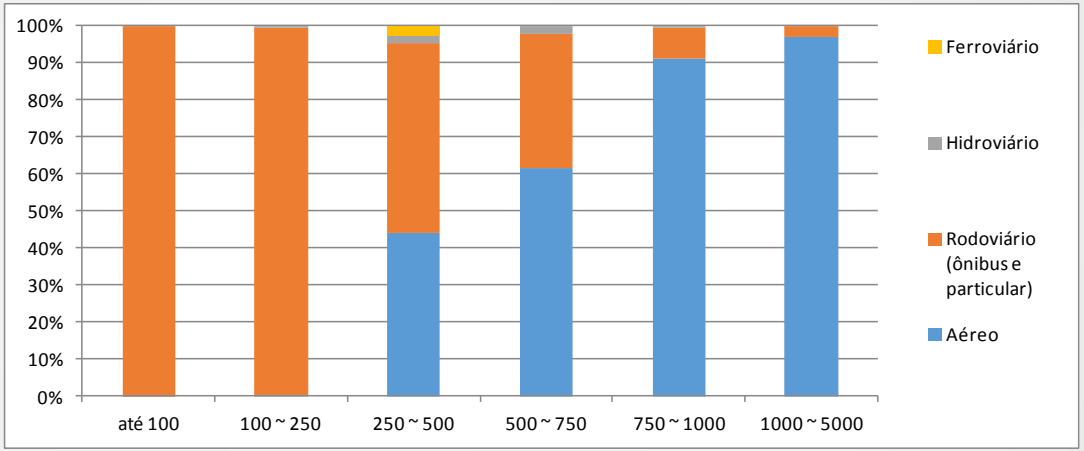
- 0 - 753.753
- 753.753 - 3.012.861
- 3.012.861 - 6.037.729
- 6.037.729 - 27.008.832
- 27.008.832 - 81.932.551

Top 10 – Interurban O/D in Brazil (by UTP)

ID	O	D	Pessoas/ano
228-267	Novo Hamburgo - RS	Porto Alegre - RS	16.614.852
34-316	Santos - SP	São Paulo - SP	16.524.684
13-316	Americana - SP	São Paulo - SP	14.560.752
254-284	Petrópolis - RJ	Rio de Janeiro - RJ	12.662.472
316-318	São Paulo - SP	São Roque - SP	12.007.176
312-316	São José dos Campos - SP	São Paulo - SP	11.792.136
111-279	Fortaleza - CE	Redenção - CE	10.113.780
51-316	Bragança Paulista - SP	São Paulo - SP	10.108.344
78-278	Caruaru - PE	Recife - PE	9.523.272
170-316	Itu - SP	São Paulo - SP	9.181.368

Modal split of interurban transport in Brazil

Modal split of interurban transport of people in Brazil, by distance.



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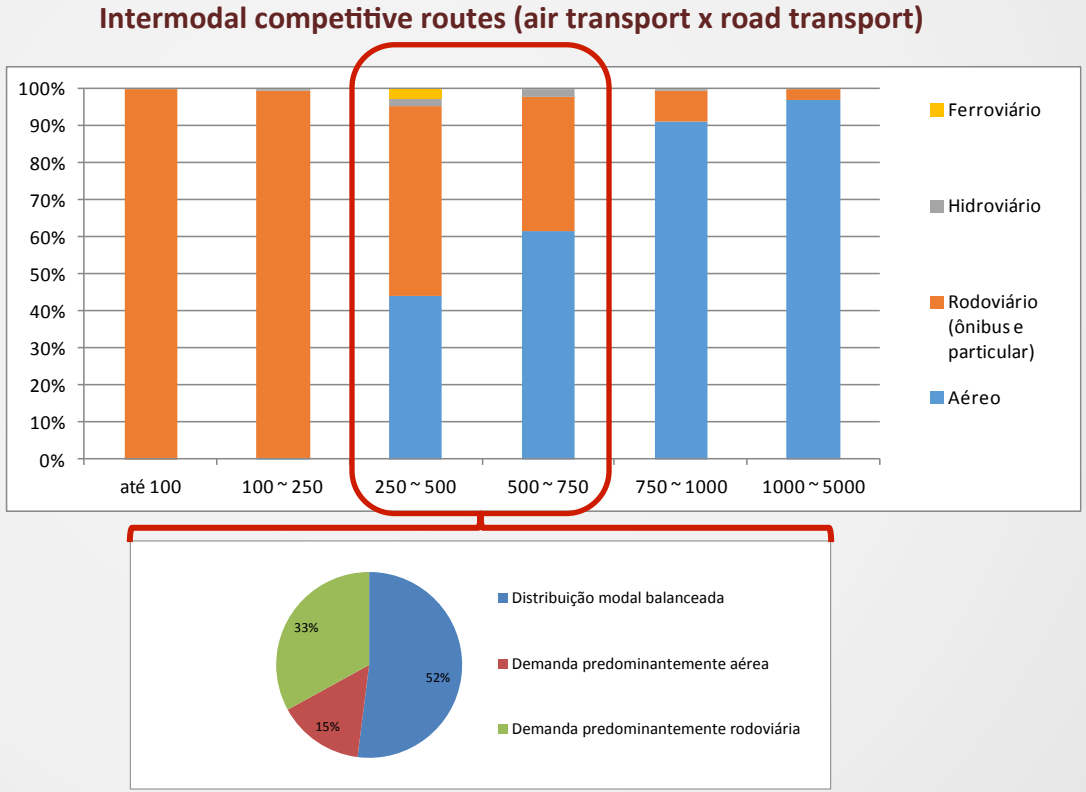

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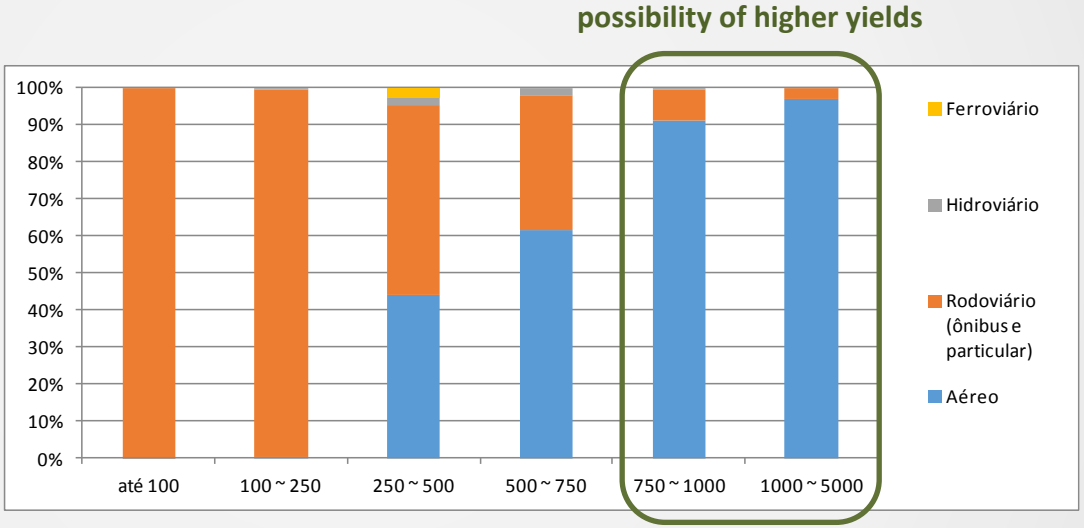

Next steps

- Analysis and treatment of final matrix version
- Identification of potential demands for air transport
- development of a practicability model of air routes by aircraft type

MINISTRY OF INFRASTRUCTURE

MINISTÉRIO DA INFRAESTRUTURA
Secretaria Nacional de Aviação Civil

Departamento de Planejamento e Gestão Aeroportuária

Coordenação Geral de Planejamento e Estudos da Aviação Civil

Dúvidas e sugestões: dpg.sac@transportes.gov.br

Thank you!